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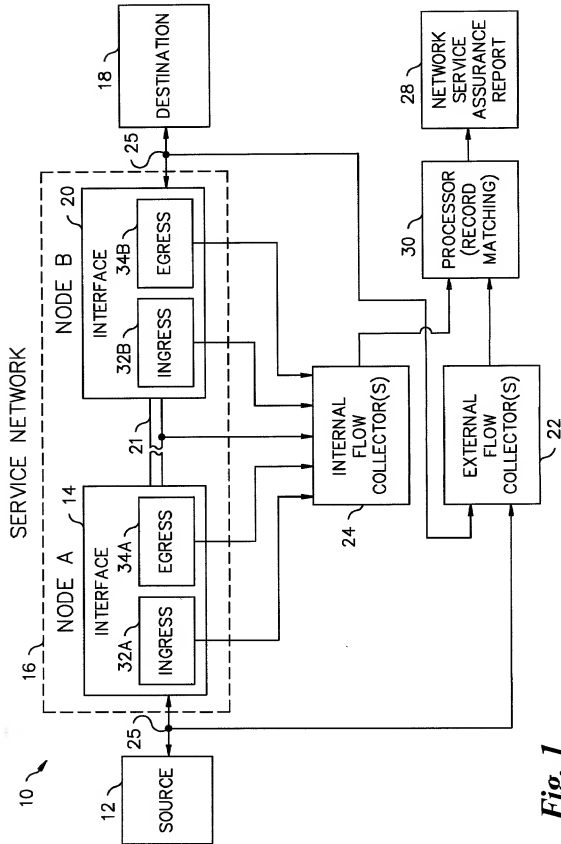


Fig. 1

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TIME STAMP DATA		FLOW ACTIVITY RECORDS	
START TIME	END TIME OR DURATION	FLOW DESCRIPTOR	PERFORMANCE METRICS
t_1		fd_1	pm_1
t_2		fd_2	pm_2
\vdots		\vdots	\vdots
t_n		fd_n	pm_n

Fig. 2
(Prior Art)

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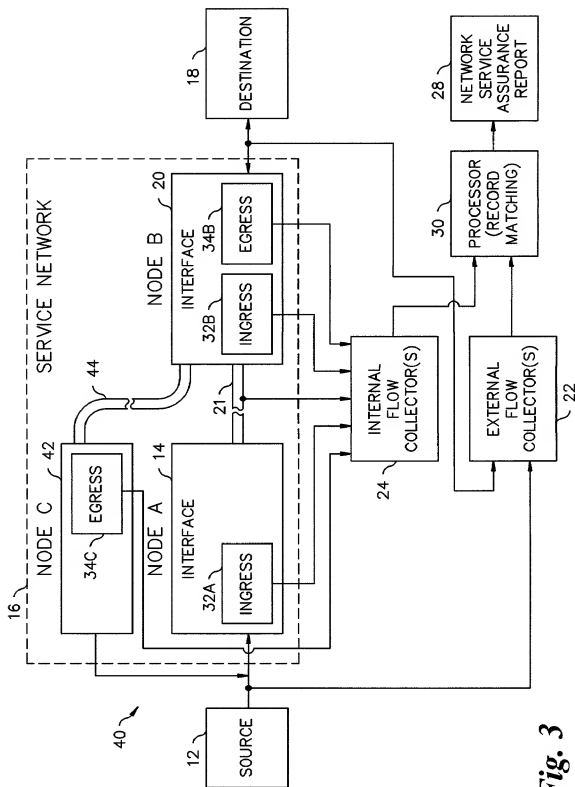


Fig. 3

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EXAMPLE (ALL FOR fd_1)	EXTERNAL FLOW COLLECTOR (TOTAL PACKETS)	INTERNAL FLOW COLLECTOR (TOTAL PACKETS)		EXTERNAL FLOW COLLECTOR (TOTAL PACKETS)	DATA ANALYSIS
	SOURCE EGRESS	SERVICE NETWORK INGRESS	SERVICE NETWORK EGRESS		
1	14	14	14	14	NO LOSS LOSS IN SERVICE NETWORK LOSS OUTSIDE OF SERVICE NETWORK LOSS INSIDE AND OUTSIDE OF SERVICE NETWORK LOSS OUTSIDE OF SERVICE NETWORK WITH ALTERNATE PATH INTO SERVICE NETWORK LOSS OUTSIDE OF SERVICE NETWORK WITH ALTERNATE PATH AROUND SERVICE NETWORK
2	10	10	9	9	
3	10	9	9	9	
4	14	11	10	10	
5	10	5	10	10	
6	10	5	5	10	

Fig. 4

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EXTERNAL FLOW COLLECTOR (SEQUENCE NUMBER)		INTERNAL FLOW COLLECTOR (SEQUENCE NUMBER)	
SOURCE EGRESS	DESTINATION INGRESS	SERVICE NETWORK INGRESS EXAMPLE 1	SERVICE NETWORK INGRESS EXAMPLE 2
10001	10001	10001	10001
10002	10002		10002
10003	10003	10003	
10004	10004		
10005	10005	10005	10005
10006	10006		10006
10007	10007	10007	
10008	10008		
10009	10009	10009	10009
10010	10010		10010
DIAGNOSIS		ROUND-ROBIN LOAD BALANCING	LOAD BALANCING

Fig. 5

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EXAMPLE	EXTERNAL FLOW COLLECTOR	INTERNAL FLOW COLLECTOR		EXTERNAL FLOW COLLECTOR	DESTINATION REACHABLE?
		SERVICE NETWORK INGRESS	SERVICE NETWORK EGRESS		
1	fd ₁	fd ₁	fd ₁	fd ₁	YES
2	fd ₁	fd ₁	fd ₁	no fd ₁	NO
3	fd ₁	fd ₁	no fd ₁	no fd ₁	NO
4	fd ₁	no fd ₁	no fd ₁	no fd ₁	NO
5	fd ₁	no fd ₁	no fd ₁	fd ₁	YES

Fig. 6

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EXAMPLE	EXTERNAL FLOW COLLECTOR	INTERNAL FLOW COLLECTOR	CONNECTIVITY?
	SOURCE	SERVICE NETWORK	
1	fd_1 (i, e)	fd_1 (i, e)	YES
2	fd_1 (no i, e)	fd_1 (i, no e)	NO
3	fd_1 (no i, e)	fd_1 (i, e)	NO

Fig. 7

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NETWORK ROUND-TRIP DELAY FROM MATCHED FLOW RECORDS

SPECIFIC CALCULATION	DESCRIPTION	METHOD
RTT ₁	TOTAL NETWORK DELAY ($dt_1 + dt_2 + dt_3$)	TIME DURATION (FR _{E1}) - TIME DURATION (FR _{E2})
RTT ₂	NON REMOTE NETWORK DELAY ($dt_1 + dt_2$)	TIME DURATION (FR _{E1}) - TIME DURATION (FR ₁₂)
RTT ₃	NON LOCAL NETWORK DELAY ($dt_2 + dt_3$)	TIME DURATION (FR ₁₁) - TIME DURATION (FR _{E2})
RTT ₄	LOCAL NETWORK DELAY (dt_1)	TIME DURATION (FR _{E1}) - TIME DURATION (FR ₁₁)
RTT ₅	SERVICE NETWORK DELAY (dt_2)	TIME DURATION (FR ₁₁) - TIME DURATION (FR ₁₂)
RTT ₆	REMOTE NETWORK DELAY (dt_3)	TIME DURATION (FR ₁₂) - TIME DURATION (FR _{E2})

$$\text{Time Duration}(\text{FR}_X) = \text{FR}_{\text{LastTime}} * - \text{FR}_{\text{StartTime}}^{\dagger}$$

$$\text{Time Duration}(\text{FR}_X) = \text{FR}_{\text{Duration}}$$

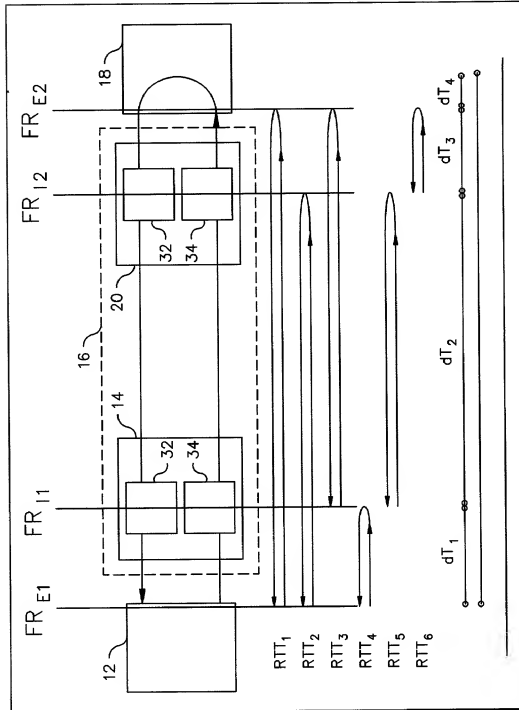
† TIME REPRESENTS THE TIMESTAMP OF THE FIRST PACKET TRANSMITTED FROM THE SOURCE TO THE DESTINATION.

* TIME REPRESENTS THE TIMESTAMP OF THE LAST PACKET TRANSMITTED FROM THE DESTINATION TO THE SOURCE.

Fig. 8A

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Fig. 8B



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ONE-WAY DELAY DETERMINATION FROM MATCHED FLOW RECORDS

SPECIFIC CALCULATION	DESCRIPTION	METHOD
OWD ₁	LOCAL NETWORK EGRESS DELAY	StartTime (FR ₁₁) - StartTime (FR _{E1})
OWD ₂	SERVICE NETWORK INGRESS DELAY	StartTime (FR ₁₂) - StartTime (FR ₁₁)
OWD ₃	REMOTE NETWORK INGRESS DELAY	StartTime (FR _{E2}) - StartTime (FR ₁₂)
OWD ₄	REMOTE NETWORK EGRESS DELAY	LastTime (FR ₁₂) - LastTime (FR _{E2})
OWD ₅	SERVICE NETWORK EGRESS DELAY	LastTime (FR ₁₁) - LastTime (FR ₁₂)
OWD ₆	LOCAL NETWORK INGRESS DELAY	LastTime (FR _{E1}) - LastTime (FR ₁₁)

$$\text{StartTime}(\text{FR}_x) = \text{FR}_{\text{StartTime}}^{\dagger}$$

$$\text{LastTime}(\text{FR}_x) = \text{FR}_{\text{LastTime}}^*$$

$$\text{LastTime}(\text{FR}_x) = \text{FR}_{\text{StartTime}}^{\dagger} + \text{FR}_{\text{Duration}}^*$$

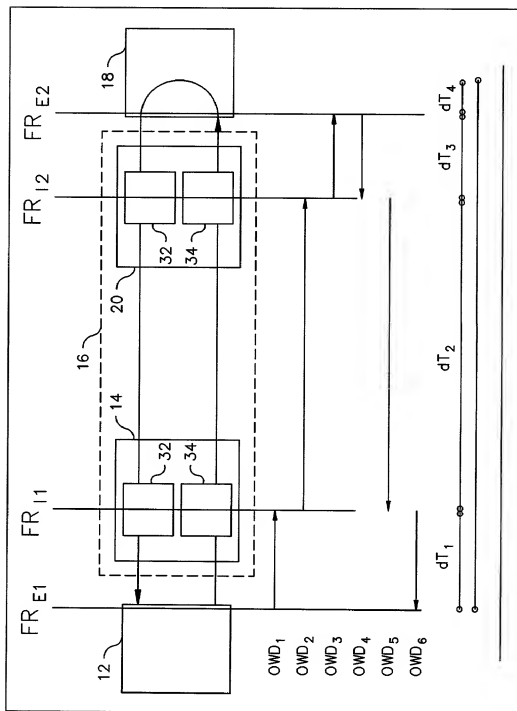
[†] TIME REPRESENTS THE TIMESTAMP OF THE FIRST PACKET TRANSMITTED FROM THE SOURCE TO THE DESTINATION.

* TIME REPRESENTS THE TIMESTAMP OF THE LAST PACKET TRANSMITTED FROM THE DESTINATION TO THE SOURCE.

Fig. 9A

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Fig. 9B



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